

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
18 August 2005 (18.08.2005)

PCT

(10) International Publication Number  
**WO 2005/074379 A3**

(51) International Patent Classification<sup>7</sup>: **A61B 5/02**,  
5/103, 5/117

(21) International Application Number:  
PCT/IL2005/000158

(22) International Filing Date: 9 February 2005 (09.02.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
160308 10 February 2004 (10.02.2004) IL

(71) Applicant and

(72) Inventor: BEN YESHA, Itshak [IL/IL]; -, 73188 Shilat  
(IL).

(74) Agent: APPELFELD ZER LAW OFFICE; 29 Lilin-  
blum, 65133 Tel-aviv (IL).

(81) Designated States (*unless otherwise indicated, for every  
kind of national protection available*): AE, AG, AI, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,

GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SI, SM, SY, TJ,  
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA,  
ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every  
kind of regional protection available*): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO,  
SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,  
GQ, GW, ML, MR, NE, SN, TD, TG).

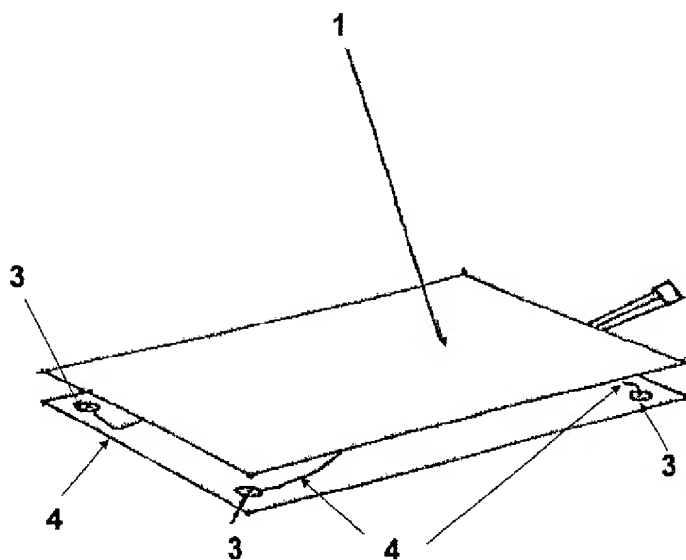
Published:

— with international search report  
— before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

(88) Date of publication of the international search report:  
22 September 2005

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: METHOD FOR DETECTING HEART BEAT AND DETERMINING HEART AND RESPIRATION RATE



(57) Abstract: Disclosed is an apparatus and system for non-invasively detecting and determining the heart rate and respiration rate of a patient, while the patient is within their sleep environment, suitable for both home and hospital monitoring, which includes an array of at least two pressure-sensitive sensors, positioned under the mattress, which gathers data from the patient corresponding to the vertical and horizontal movements of the body, and wherein the data from each sensor is collected, filtered, and analyzed and finally, the difference between the results gathered from each sensor detects and determines heart and respiration rates.

WO 2005/074379 A3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL05/00158

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) : A61B 5/02, 5/103, 5/117 US CL : 600/500, 483, 595, 481 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 600/500-503, 483, 595, 481, 484, 529, 534, 535, 552, 587 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EAST		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,506,153 B1 (LITTEK et al) 14 January 2003 (14.01.2003), Abstract and Figures 3 and 5.	1 and 11
A	US 6,030,347 A (NAKAMURA et al) 29 February 2000 (29.02.2000), Abstract and Figure 2.	1 and 11
A	US 4,438,771 A (FRIESEN et al) 27 March 1984 (27.03.1984), Abstract and Figures 1 and 2.	1 and 11
A	US 4,066,072 A (CUMMINS) 03 January 1978 (03.01.1978), Abstract and Figures 1, 10, 10A, and 10B.	1 and 11
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"I"
"E"	earlier application or patent published on or after the international filing date	"X"
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search 26 June 2005 (26.06.2005)		Date of mailing of the international search report 05 JUL 2005
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230		Authorized officer Navin Natnithithadha Telephone No. (571) 272-2975

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL.05/00158

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61B 5/02, 5/103, 5/117

US CL : 600/500, 483, 595, 481

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 600/500-503, 483, 595, 481, 484, 529, 534, 535, 552, 587

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EAST

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,506,153 B1 (LITTEK et al) 14 January 2003 (14.01.2003), Abstract and Figures 3 and 5.	1 and 11
A	US 6,030,347 A (NAKAMURA et al) 29 February 2000 (29.02.2000), Abstract and Figure 2.	1 and 11
A	US 4,438,771 A (FRIESEN et al) 27 March 1984 (27.03.1984), Abstract and Figures 1 and 2.	1 and 11
A	US 4,066,072 A (CUMMINS) 03 January 1978 (03.01.1978), Abstract and Figures 1, 10, 10A, and 10B.	1 and 11

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"H" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"X" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"Y" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Z" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

26 June 2005 (26.06.2005)

Date of mailing of the international search report

02 AUG 2005

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Navin Nutsuthithachai

Telephone No. (571) 272-2975